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## **The Bahamian Problem in Florida Archaeology: Oceanographic Perspectives on the Issue of Pre- Columbian Contact**

**Ryan M. Seidemann**

### **Introduction**

The origins and relationships of the prehistoric inhabitants of the Bahamas and those of the southeastern United States have been the subject of much debate for over a hundred years. This study examines the oceanographic implications of the Florida Current on prehistoric contact between these two regions. The paper also considers previously published oceanographic literature in conjunction with the current anthropological evidence from the Caribbean and the south-eastern United States, and inferences for ocean voyaging from the Pacific to suggest probable areas that may yield evidence of contact.

Historic accounts have alluded to the fact that the Lucayan inhabitants of the prehistoric Bahamas were aware of land to the northwest (i.e., Florida), but this popular conception may have originated from Spanish misinterpretations or misrepresentations as had occurred concerning the Fountain of Youth, typically associated with Ponce de Leon. Peck (1992; 1993) casts significant doubt on the motivations of this myth for Spanish explorations which led to the discovery of the Florida mainland. No mention of the Fountain of Youth exists in Ponce de Leon's charter for the exploration of Birnini (Peck 1992:115). Descriptions of land to the north of the Bahamas by the time of the Spanish conquest of Florida may have been the result of historic movements of native groups fleeing the Spanish or some of the unsanctioned voyages of Spanish exploration (Milanich 1995: 107). Weber (1992) suggests that this myth was of ancient European origin rather than Caribbean, casting doubt on the native populations' knowledge of Florida as related in the popular Fountain of Youth myths (eg. Weddle 1985). Due to the problematic nature of the Fountain of Youth myth (outlined in Arana 1965; Peck 1992, 1993; Weber 1992) this piece of popular folklore should not be considered as incontrovertible evidence that the Lucayan Taínos (the pre-Columbian inhabitants of the Bahamas) were knowledgeable about the Florida mainland during prehistoric times.

Watters(1982: 2) argues for the importance of archaeologists to be cognizant of the dynamic ocean processes that have affected past human populations. Although earlier studies (Cruxent and Rouse 1969; Evans and Meggars 1976; Sleight 1965) emphasized the importance of the oceanography and climatology of the Caribbean in understanding prehistoric contact. no detailed examination of these factors, as yet, has been undertaken. This study reviews oceanographic data and underscores the necessity for anthropologists to consider oceanographic research when interpreting movements of past peoples in an insular environment.

This paper attempts to fill the gap in the research of the contact issue by taking a “seaward”: approach to the late prehistoric record of the Bahamas, as suggested by Watters (1981. 1982) and Watters and Rouse (1989) Much of the decision to focus this paper on Bahamas-to-Florida contact and not Florida-to-Bahamas contact is based on this “seaward perspective of Watters’ (1982), which basically suggests that the ocean-focused Lucayans instead of the riverine-focused Florida Indians would have been more likely to initiate contact. The Florida Indians might have seen the ocean as a barrier rather than a highway. In contrast, the Lucayans, or any ocean-going inhabitants of the insular Caribbean. would not likely have seen the vast expanses of the ocean as a barrier, but rather as a highway upon which they transported their trade goods from one island to the next (much as the modern Bahamians do). The expanse of the ocean to the northwest of the Bahamas likely appeared the same to the Lucayans as the large ocean gaps between their own islands. In addition to the perceived barrier of the open ocean, the Florida Current, apart of the Gulf Stream, probably constituted a true barrier as it flowed in a northeasterly direction between Florida and the Bahamas. Additionally, the prehistoric inhabitants of the Bahamian archipelago were a highly mobile seafaring group, establishing over-water trading networks throughout the islands (Watters 1997). The rapid dispersal of peoples throughout the whole of the West Indies begs the question,

“Why stop at the northernmost Bahamian islands?” Following the suggestions of Watters (1982). I have incorporated the available scholarship on the prehistoric voyaging and migrations in the Pacific. Unlike the archaeological record of the Bahamas. the Pacific offers a long chronology from which to interpret motivations for migrations from one island to the next, archaeological evidence for migrations. and navigational techniques.

## **Previous Research**

The past century yielded a vast amount of scientific and avocational theorizing on the origins and migrations of the prehistoric inhabitants of the Caribbean (see Table 1 which provides the essential information regarding these publications). Many of the scholars changed their opinions on the contact issue over time as more information became available.

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Table 1. Summary of previous research on Caribbean-Florida contact

Author	Date <sup>1</sup>	Issue <sup>2</sup>	Contact? <sup>3</sup>	Direction <sup>4</sup>	Evidence <sup>5</sup>
Brinton	1871	origins	no	FL→C/C→FL	linguistic
Brooks	1888	origins	yes	C→FL	skeletal
Holmes	1894	contact	yes	FL→C/C→FL	artifactual
Cushing	1896	contact	yes	C→FL	historic accounts
Fewkes	1904	contact	yes	FL→C/C→FL	artifactual
Fewkes	1907	contact	yes	FL→C/C→FL	artifactual
Harrington	1921	origins	yes	FL→C/C→FL	artifactual
Gower	1927	origins	no	FL→C/C→FL	trait comparisons
Lovén	1935	origins	yes	FL→C/C→FL	trait comparisons
Stirling	1936	contact	possible, not likely	FL→C/C→FL	trait comparisons, artifactual
Stone	1939	origins	yes	Cent./S Amer. & Carib.→FL	artifactual
Rouse	1940	contact	possible	FL→C	ceramics
Griffin	1943	contact	possible	circum-Caribbean	trait comparisons
Steward	1948	contact	yes	circum-Caribbean	trait comparisons
Goggin and Rouse	1948	contact	probable	C→FL	axe
Rouse	1951	origins	probable	N. Amer.→C	Ciboney orientation towards land
Howells	1954	contact	possible	C→FL	arrival of Mississippian period (influences from the South)
Granberry	1956	contact	probably not	FL→C/C→FL	ceramics
Granberry	1957	origins	possible	FL→C	similarities of Ciboney culture to that of Floridian cultures
Rouse	1958	contact	possible	FL→C/C→FL	burial customs, shell gouges, ceramics
Sturtevant	1960	contact	no	FL→C/C→FL/ circum-Caribbean	trait comparison
Rouse	1964	contact	not enough evidence	FL→C/C→FL	ceramics, shell gouges
Ford	1966	origins	yes	C→FL and GA	ceramics

Table 1. Continued

Author	Date <sup>1</sup>	Issue <sup>2</sup>	Contact? <sup>3</sup>	Direction <sup>4</sup>	Evidence <sup>5</sup>
Hoffman	1967	contact	possible	FL→C/C→FL	geographic proximity
Cruxent and Rouse	1969	origins/contact	no	FL→C/C→FL	artifactual
Granberry	1971	contact	yes	C→FL	linguistic
Bullen	1974	contact	possibly, not likely	FL→C/C→FL	ceramics, other artifacts
Bullen	1976	contact	no	FL→C/C→FL	artifactual
Evans and Meggers	1976	contact	possible	C. Amer→Cuba	gulf stream flow
Sears	1977	origins	yes	S. Amer.→C→FL	agricultural practices
Carr and Riley	1982	contact	possible	FL→C	effigy bottle
Rouse	1986	contact	possible, not likely	FL→C	shell gouges
Marquardt	1987	contact	possible, not likely	FL→C/C→FL	agricultural, linguistic
Keegan	1987	contact	possible, not likely	S. Amer.→C→FL	agricultural practices
Lathrap	1987	origins	probable	S. Amer. →C→FL	agricultural practices
Siegel	1991	contact	possible	S. Amer. →C →FL	agricultural practices
Moure and de la Calle	1996	contact	possible	FL→C	gulf stream, geographic proximity

1 date of publication

2 indicates whether the topic being addressed by each author examines prehistoric contact or the origins of the peoples of the particular regions

3 indicates the general opinion of each author on whether or not some level of interaction occurred between these areas.

4 indicates the direction of movement examined by each author—FL=Florida, C=Caribbean, C. Amer.=Central America, S. Amer.=South America, N. Amer.=North

America, arrows Indicate the direction of movement examined by the author.  
5 this generally indicates the type of evidence used, whether artifactual, geographic, or linguistic. For detailed descriptions of these data, the reader is directed to the original sources.

More recent studies (Callaghan 1999; Elbow 1992; Rouse 1986; Wilson et al. 1998) have also examined the issue of Central American Caribbean contacts and migrations and suggest that the inhabitants of the Caribbean were capable ocean-going seafarers.

## **Why Migrate?**

Several current hypotheses offer differing perspectives on motivations for migration in the prehistoric Bahamas. These are buttressed by older theories concerning motivations for prehistoric voyaging and information from the Pacific, which is also relevant to the present study. The information contained in Table 2 summarizes the publications dealing with the debate about the motivations for the colonization of the Bahamas. Although this paper is not specifically concerned with the initial colonization(s) of the Bahamian archipelago, the possible motivations for these colonization activities may be analogous to the motivations for possible Floridian contact. The majority of the papers outlined in Table 2 suggest “push/pull” motivators for colonization (as described by Lee 1966), most of which center around population densities

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## **Figure 1. Map of the Caribbean**



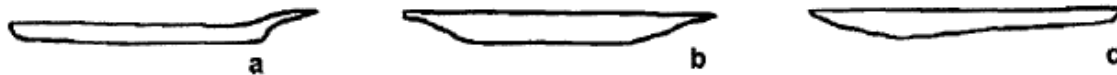
pushing people out and resource exploitation pulling people away.

Keegan (1985, 1992: 1997) suggests that the total population of the Bahamian islands was at least 40,000 at the time of European contact. Additionally, he adds that the northernmost islands (Grand Bahama, Great Abaco, and Andros) had been settled for some time when Columbus arrived in A.D. 1492. Even though the population expansion could have eventually created an economic “need,” such as those described above, for migration to a new locale (i.e., Florida), the timing of such a model (i.e., late in the prehistoric period) makes it questionable whether or not such a necessity would have arisen prior to the arrival of the Europeans. Irwin’s (1990:92) economic models for migration in the Pacific offer a useful analogy. He argues, based on archaeological reconnaissance and the analysis of radiocarbon dates, that the major migration events in the Pacific took place at the times of the lowest population densities. While traditional economic models are valid for suggesting a push/pull migration pattern, stressful economic conditions are not a prerequisite to force migration under Irwin’s (1990) interpretation. Thus, although the late arrival of peoples in the northernmost Bahamian islands (ca. A.D. 1200) makes economic factors questionable (i.e., could they have depleted their resources, necessitating a migration, in such a short amount of time?) for migration to Florida, alternative possibilities would have allowed for almost immediate exploration following the colonization of these islands, thereby increasing the time available before the arrival of the Europeans. Keegan and Diamond (1987) suggest that the motivation for island colonization differs from that of exploration, whereby the migrants continued to explore new, unknown areas of ocean because of the expectation of finding new land. Under such a model, the orientation of the islands of the Caribbean (see

Figure 1) provide a linear track which could have directed settlers along the islands and ultimately towards Florida. This model is part of the theory of autocatalysis, which states basically that the idea of a return voyage was an expected component of exploration (i.e., explorers did not set out on voyages of no return). Irwin (1989:176) initially doubted the validity of this model, based primarily on problems unique to Oceania. He now agrees that this type of voyaging was likely the primary method employed in prehistory (Irwin 1992). The remainder of this study attempts to determine whether the natural and technological factors present in the late prehistoric Bahamas were conducive to such contact. This author assumes (after Keegan 1992, 1997) that the northernmost Bahamian islands were settled at least 100 years prior to European contact: and that, based on most of the studies in Table 2, there were motivations for further colonization. What

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## Figure 2



These three vessels are after Callaghan (1999) and illustrate the types of Caribbean vessels discussed in the text ([a] the Florida Type-3 canoe [cf. Newsom and Purdy 1990]; [b] the Maya canoe; [c] the Warao canoe).

I present here is an evaluation of the factors that could have impeded such migration.

## Watercraft in Prehistory

### *The Caribbean*

Little primary evidence exists from the Caribbean on the appearance and design of prehistoric watercraft. Much of the knowledge of the prehistoric Caribbean is drawn from archaeological and historic contexts of the surrounding areas (i.e., Maya area; Orinoco region; Florida) (Callaghan 1995, 1999). Only two archaeological examples of watercraft are known to exist from the Caribbean (one from Cuba and one from Andros Island in the Bahamas) (Callaghan and Schwabe 1999). Additionally, a brief description exists of a prehistoric canoe discovered in a Jamaican cave (Cundall 1894-5) and there is an unconfirmed report of one discovered in Trinidad (Callaghan, communication 1999).

Several authors have examined Spanish Colonial evidence for clues as to the nature of watercraft in the Caribbean (Glazier 1991; Johnstone 1980; McKusick 1960; Sauer 1966). Although historic accounts are sometimes conflicting on this topic, it is unlikely

that the Pre-Columbian inhabitants of the Caribbean possessed sail technology (Glazier 1991:152). McKusick (1960:5) states that vessels with sailing capabilities were recorded by most observers after A.D. 1650. He dismisses the presence of aboriginal sails by that late date as a result of European contact. While speculation still persists as to the presence or absence of sail technology, the majority of the evidence suggests that neither the Taíno nor the Florida Indians possessed such technology prior to European contact (McKusick 1960; Newsom and Purdy 1990). Although, there are reports of voyages between Florida and Cuba during the historic period (Hann 1991); these sources are not very helpful because it is impossible to know what influence the European technology and knowledge had on such voyages.

Based upon the accounts of Columbus and his associates (see Sauer 1966) regarding the size of Caribbean dugout canoes, some sort of construction beyond simply hollowing a single tree trunk was necessary. The length of the vessel which held seventy to eighty persons, as described by Columbus (McKusick 1960:8; see also Wilbert 1977:18), was not likely constructed out of a single piece of timber. Johnstone (1980:235) suggests that the canoe lengths described by Columbus and by Bernaldez (McKusick 1960) must have been accomplished by lashing on planks. McKusick (1960:7) and Johnstone (1980:235) agree that the lashing of planks with fiber would suggest an aboriginal origin of this practice rather than an imitation of the Europeans (which would have implied the use of a nail-like device), and that such technology was present prior to European contact. McKusick (1960:4) states that plank technology would allow for a more seaworthy craft. Unfortunately, archaeological evidence for the interpretation of West Indian watercraft is lacking (Leshikar 1996:19), forcing scholars to speculate based on scant historical accounts. While the dugout was, undoubtedly, the primary type of watercraft in use by the native populations at the time of Spanish contact (Leshikar 1996:19; Johnstone 1980:234), the specific design of dugout canoe is still unclear. Callaghan (1995, 1999) and Callaghan and Schwabe (1999) have combined archaeological and documentary evidence from the Maya area, the Caribbean, the Orinoco region of South America, and Florida to reconstruct the appearance and seadaring capabilities of Caribbean watercraft. They conclude that the appearance of Taíno canoes resembled the overhanging bow style canoe described by Newsom and Purdy (1990: 170-171) (see Figure 2). However, they note that a Lucayan canoe discovered in the Bahamas (Callaghan and Schwabe 1999) resembles vessels from the Orinoco region (e.g., Figure 2c).

Evidence for the seacraft on the opposite side of the Straits of Florida is widely available, with a total of nearly 200 canoes known in existence from the waterways of Florida, spanning over 5,000 years (Newsom and Purdy 1990: 164). On the other hand, prehistoric contact from the North American mainland to the Bahamas is unlikely (as opposed to Bahamian-to-North American contact) due to adverse ocean currents and other factors. As with their Caribbean counterparts, the Floridian watercraft were dominated by dugout canoes, but these were mostly utilized for riverine transport. The early vessels were manufactured by hollowing tree trunks with fire, sometimes evidenced by a charred interior (Newsom and Purdy 1990:170). The overhanging bow style of the Type 3 examples of Newsom and Purdy (1990:170-171) closely resemble the Taíno canoes described by Callaghan (1995: 184) (see Figure 2).



In contrast to the Florida watercraft as described by Newsom and Purdy (1990) and Bullen and Brooks (1967), which were likely created for use in riverine environments, Callaghan (1999) and Callaghan and Schwabe (1999) note that the Caribbean vessels were designed for open ocean

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**Table 2. Summary of theories regarding migrations in the Caribbean**

Author	Date <sup>1</sup>	Origin <sup>2</sup>	Destination <sup>3</sup>	Motivation <sup>4</sup>	Colonization Date <sup>5</sup>
DeBooy	1912	Haiti	Bahamas (non-specific)	fled Caribs	c. A.D. 1400+
Granberry	1956	Haiti	Turks and Caicos	not specified	A.D. 800-900
Hoffman	1967	Hispaniola/Cuba	Bahamas (non-specific)	non-specific population movements	A.D. 700-900
Hoffman	1970	Hispaniola	Bahamas (non-specific)	non-specific population movements	A.D. 700-900
Sears and Sullivan	1978	Hispaniola/Cuba	Turks and Caicos	push/pull economic model: overpopulation, conch, and salt	A.D. 750-900
Sullivan	1980	Hispaniola/Cuba	Turks and Caicos	push/pull economic model: overpopulation, conch, and salt	A.D. 750-900
Sullivan	1981	Hispaniola/Cuba	Turks and Caicos	push/pull economic model: overpopulation, conch, and salt	A.D. 750-900
Rose	1982	Haiti and Cuba	Caicos/Central Islands	Greater Antilles (unspecified)	A.D. 800-900
Rouse	1982	west Haiti or east Cuba	Bahamas (non-specific)	external factors, internal resource exploitation, population growth	A.D. 800-1200
Keegan	1985	Hispaniola and Haiti	Great Inagua	push/pull factors, population growth	A.D. 600-800
Winter et al.	1985	north central Hispaniola/Cuba	Turks and Caicos	island propinquity, flamingo migrations, availability of unexploited resources	A.D. 900
Rouse	1986	west Haiti or east Cuba	Bahamas (non-specific)	external factors, internal resource exploitation, population growth	A.D. 800-1200

navigation. the width of the Caribbean vessels, which exceeds that of the Floridian seacraft would have provided added stabilization on the open ocean. The Caribbean canoes are also thought to have been more maneuverable than their Floridian counterparts (Callaghan 1999: 15).

### ***The Pacific***

Numerous experimental voyages employing prehistoric vessel and navigation technology have been accomplished in the Pacific area (e.g. Finney 1997, 1988; Finney et al. 1986, 1989; Gladwin, 1970; Lewis 1972) these studies, as well as larger studies of Pacific seafaring are relevant for comparative study with other island archipelagoes (Keegan 1993: 246), including the Caribbean.

Doran(1981) describes several types of vessel form the Pacific area; bark boats, rafts, dugouts, double-outrigger canoes. The majority

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**Table 2. continued**

Author	Date <sup>1</sup>	Origin <sup>2</sup>	Destination <sup>3</sup>	Motivation <sup>4</sup>	Colonization Date <sup>5</sup>
Keegan and Diamond	1987	Hispaniola and Haiti	Great Inagua	autocatalysis	A.D. 600-800
Keegan	1987	Hispaniola and Haiti	Great Inagua	not specified	A.D. 600-700
Keegan	1988	Haiti	Great Inagua	push/pull	c. A.D. 600
Berman and Gnivecki	1991	1. Cuba 2. Hispaniola	1. Central Bahamas 2. Turks and Caicos	pull factor, new islands favorable to root crop cultivation	1. A.D. 600-800 2. A.D. 900+
Granberry	1991	northeast Cuba	Great Inagua	not specified	A.D. 800-900
Keegan	1992	Hispaniola and Haiti	Great Inagua	push/pull factors, population growth	A.D. 600-800
Rouse	1992	west Haiti or east Cuba	Bahamas (non-specific)	external factors, internal resource exploitation, population growth	A.D. 800-1200
Keegan	1993	Hispaniola and Haiti	Great Inagua	push/pull factors, population growth	A.D. 600-800
Berman and Gnivecki	1995	Cuba	Central Bahamas	push factor out of Cuba, pull of unoccupied mesic islands, ease of transport	A.D. 600-900
Keegan	1995	Hispaniola	Bahamas (non-specific)	push/pull	c. A.D. 600

1 date of publication

2 place of origin suggested by author

3 place of destination suggested by author

4 motivations for migration suggested by author

5 suggested dates for initial colonization events by author

of these vessels, such as single and double-outrigger canoes, were sailing vessels and not comparable to the Caribbean watercraft. However: bark boats and rafts may very well have been used in prehistoric Caribbean (cf., Nicholson 197a), however these types of vessels would have become waterlogged quickly and would not have been useful in open ocean voyaging (Doran 1981; Nicholson 197a). the Pacific dugouts are probably the most closely analogous vessels to those used in the prehistoric Caribbean for interisland voyaging.

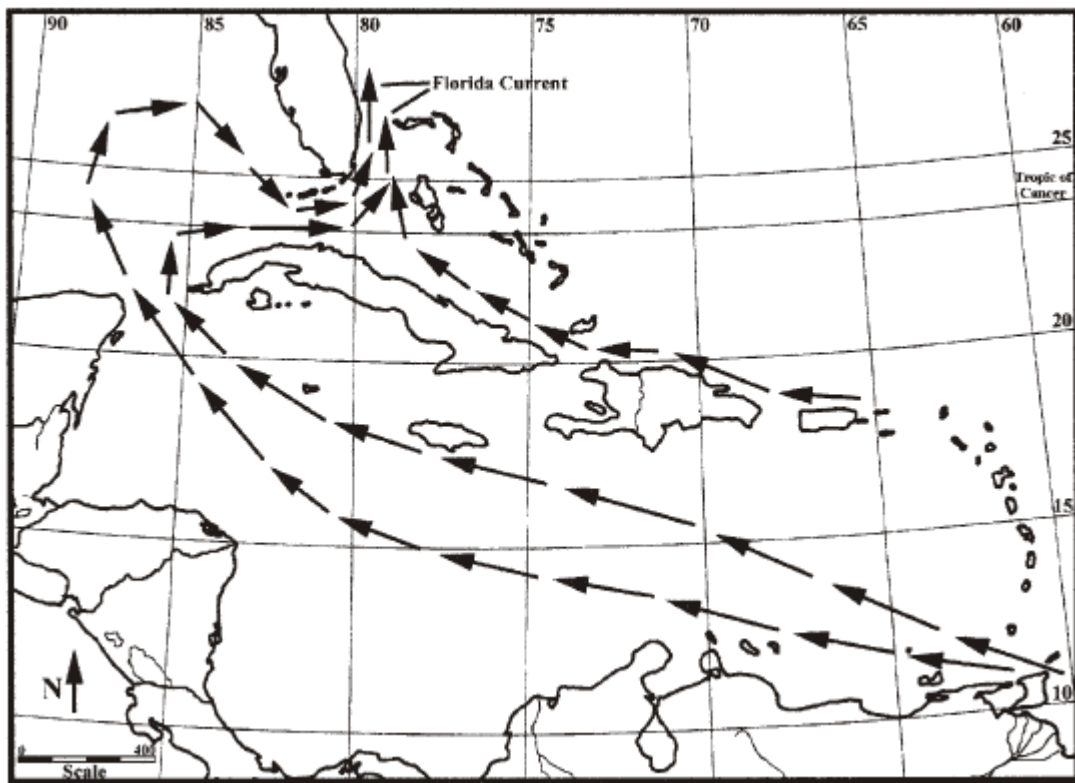
## Ocean currents

With little evidence for the construction of watercraft is available for the West Indies, various authors (Callaghan 1995; Johnstone 1980; McKusick 1960) contend that the Taino probably possessed the technology for long distance ocean travel. Whether they were able to reach the North American mainland is, therefore, an issue of environmental factors, assuming that the technology existed.

Most of the gaps between the islands in the archipelagoes of the West Indies are short enough to see the next island or intermediate keys (Keegan 1992:25-6). The currents between these islands and keys remain at a consistent calm level throughout most of the Caribbean. On the other hand, the distances between the Bahamian islands and Florida (the closest North American landmass) are as long as the longest

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**Figure 3**



Map of the showing the major ocean currents as they move through the Caribbean. The Florida Current moves to the west of the Greater Antilles and then continues between Florida and Cuba and then joins the Antilles Current as it passes through the Straits of Florida.

water gaps between the West Indian islands (see Table 3). Additionally, no keys lie between the Bahamian Islands and the mainland. Another mitigating factor with regard to the possibility of Caribbean contact with Florida is the Florida Current (a portion of the Gulf Stream), which, as Bullen (1974: 158) contends, constituted a barrier for cultural diffusion. The Gulf Stream begins south of the Gulf of Mexico in the Yucatan Channel (see Figure 3). The wind patterns of the globe directly reflect on the motions of the surface ocean currents (Davis 1977:94), and the Gulf Stream is created by a westerly drag of winds caused by the rotation of the earth and a thermohaline return flow from the South Atlantic (Chave et al.1997; Gaskell 1973; Schmitz and Richardson 1991). The thermohaline flow is a deep-ocean, density-driven circulation created by a combination of factors. This circulation is caused partly by convection of warm, salty water as it reaches the poles and cools. As the salty water cools, its buoyancy decreases, and the water sinks. Secondly, brine rejection also causes water to sink as freezing water “rejects” salt and increases the density of non-freezing waters. This process occurs continuously (with seasonal variations) with density differences “pushing” large amounts of water around the deep oceans (Cronin 1999:27). The winds which help push the current from above, are the result of the Coriolis effect, which is a deflection of moving particles, in this case air, to the right in the Northern Hemisphere, creating a clockwise circulation around the subtropical high in the Atlantic. The Coriolis effect is due to the eastward rotation of the Earth (Davis 1977; Wells 1998). By the time the currents pass through the Straits of Florida they are much like a river 64 km wide and 6 10 m deep flowing out of the Gulf of Mexico into the Atlantic Ocean (National Oceanic and Atmospheric Administration [NOAA] 1985). This is corroborated by Gaskell(1973: 13) and Sanford (1982:621) The Straits of Florida are a deep channel between the Florida peninsula and the Bahama Banks. The topography of the ocean floor in the Straits resembles a canyon that drops steeply from the small continental shelf off the Atlantic Coast of Florida to a depth of as much as approximately 780 m before steeply rising again on the Bahamian side of the channel (Defense Mapping Agency [DMA] 1996). This ‘wall of water’ separating the West Indies and Florida passes between Cuba and the Bahamian archipelago to the south and the Florida peninsula to the north (NOAA 1985:Fi

g. 1). Iselin (1936) and Fofonoff (1981) define the Florida Current as all northward-moving waters with velocities exceeding 10 cm s<sup>-1</sup> (1 m per second) which begin in a line south of the Tortugas and extend past Cape Hatteras where the current moves off the

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**Table 3. Distances between Bahamian Islands and the North American mainland (After Keegan 1985: 26)**

Origin	Destination	Distance (km)
Great Inagua	Mayaguana	90
Great Inagua	Acklins Island	120
Grand Bahama	Florida (Palm Beach)	100
Caicos Islands	Dominican Republic	150
Great Inagua	Haiti	90
Great Exuma	Cuba	260

continental shelf. The water travels through the Straits of Florida with an average velocity of 8 km/h, “discharging 100 billion tons of water per hour” (NOAA 1985:1). Certainly, this natural phenomenon presents the most significant barrier to Floridian-Caribbean contact.

Historic sources also report on the strength of the current through the Straits of Florida and the difficulty of sailing through it. The Florida Current was reported by Antonio de Herrera y Tordesillas as observed during Ponce de Leon’s 1513 voyage. “A current was observed which, though they had a good wind, they could not stem” (NOAA 1985:2). Another account from McKinnen (1804:268-9) states that the progress of his party from Grand Bahama along the Florida coast was “rapid.” He also comments that he knows of no other area where the navigation of the ocean is more difficult than along the south shores of Florida. “So very fallacious and irresistible are the cross currents and eddies, that it often happens whilst vessels are steering in one course they are carried nearly in an opposite direction” (McKimen 1804:269). Indeed, the current was strong enough that McKinnen (1804:270) states that from their departure from Grand Bahama, the Florida Current carried his party to the area of Charleston, SC, in a “short time.” The logical question now is, to what degree would this ‘river in the ocean’ have actually influenced the travels of aboriginal Caribbeans?

Although the previous sources give some insight into the nature of historic seafaring in the Gulf Stream, the question remains whether the Florida Current helped or hindered individuals attempting to cross the Straits of Florida prehistorically. Oceanographic investigation is of the velocity and transport of the current through the Straits of Florida may shed some light on this question. Fofonoff (1981:139) states that “the Florida Current emerges as the part of the Gulf Stream that is best documented, analyzed, and understood” (see also Schmitz and McCartney 1993). Sanford (1982:636-7) states that the measurements of seasonal fluctuations and amplitude of the Florida Current are in agreement whether using measurements of surface flow or subsurface measures of transport. This suggests that such factors as seasonal variation and fluctuation of the flow through the Straits of Florida, which are normally observed through deep water detection instruments (see Molinari et al. 1985; Schott et al. 1988). are analogous to the surface conditions throughout the year [cf.,

Molinari and Leaman (1987) and the DMA (1994). Surface conditions are of importance to the issue of prehistoric travel because these conditions are the realities that native seafarers confronted.

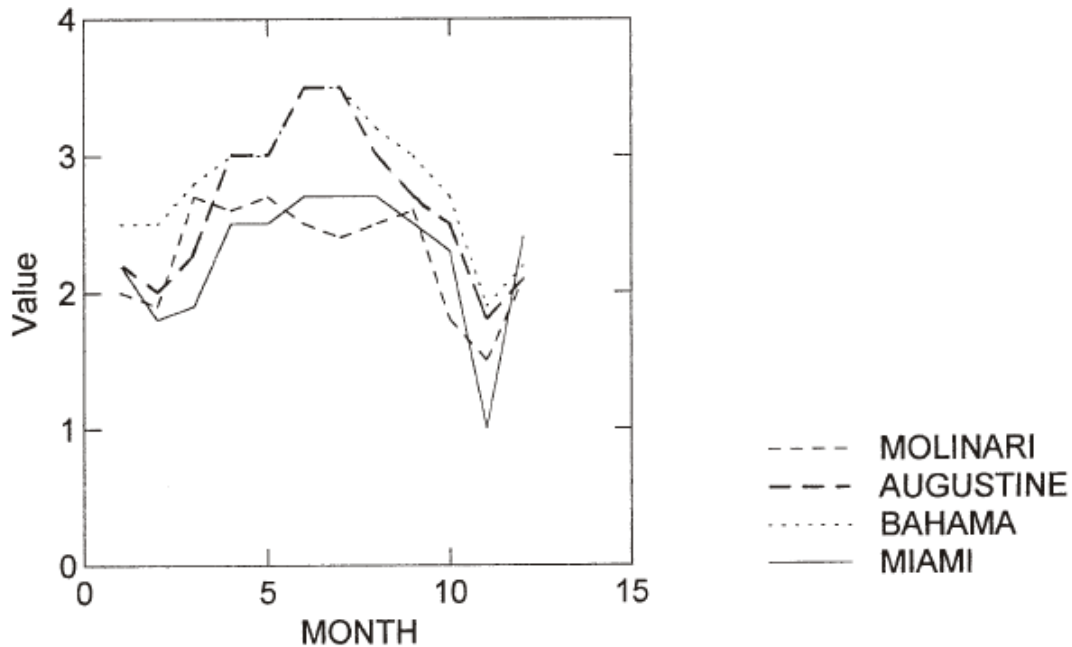
The advantage to examining the transport volume of the Florida Current (rather than the actual surface currents) is twofold: There is more oceanographic literature available on transport volume; and transport volume is more easily linked to weather patterns and changes in sea-level. an important consideration in archaeology.

Data from recent investigations at various depths into the physical properties of the Florida Current provide insight into prehistoric conditions. Niiler and Richardson (1973) determined the mean transport of the Florida Current to be  $30 \times 10^6 \text{ m}^3 \text{ s}^{-1}$ . This figure, which translates to an overall transport of thirty trillion cubic meters of water per decisecond (tenth of a second) and is referred to as 30 Sv (Sverdrups); measures the total transport of a fluid through a confined passage. Such a figure is derived from repetitive vertical profiles of the velocity from the surface to the ocean bottom where each measurement at differing depths is standardized by a constant velocity (Wells 1998:220). While the transport is not a measure of the speed of the current, this research provides clues to the seasonal variability of the current, as well as other phenomena.

Niiler and Richardson (1973: 144) suggest an annual cycle deviation of 30 Sv from the mean of 30 Sv through the Straits of Florida at the point of their investigations (a line between Miami and Bimini). While others have reported different amounts of transport through the Straits (e.g.  $x=32$  Sv by Larsen 1992;  $x=30$  Sv Schmitz and McCartney 1993;  $n=30.5$  Sv by Schott et al. 1988;  $x=27.71$  Sv by Welsh 1996), this is likely due to the various locations from which the observations were made. Additionally, none differed significantly from the 30 Sv mean transport reported by Niiler and Richardson (1973). The seasonal variation originally identified by Niiler

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## Figure 4



This graph illustrates the general trends of the flow of the Florida Current as discussed in the text. The sources, including surface flow data from the Atlas of Pilot Charts (Defense Mapping Agency 1994) and Molinari and Leaman (1987), show a clear minimum of flow speed around the months of October to December each year. The Molinari and Leaman data are referred to on the graph as "Molinari." The Defense Mapping Agency data are denoted by the closest land locations to the points where the data were derived from the adjacent Florida Current on the maps (i.e., Augustine=St. Augustine; Bahama=West End, Grand Bahama Island; Miami=Miami).

and Richardson (1973) may provide a basis for interpreting the ideal time of the year for the occurrence of Bahamas to Florida travel. Numerous authors (Gee et al. 1985; Schott and Zantopp 1985; Schott et al. 1988) have documented a significant annual drop in the transport, and by inference a decrease in the speed of the flow (Molinari and Leaman 1987), of the Florida Current around the months of October and November (see Figure 4). Schott et al. (1988: 1212) report an early winter low around 20 Sv, while Schott and Zantopp (1985:308) report an early winter low of 25.4 Sv. This winter low could have equated to less treacherous traveling conditions for prehistoric peoples (see also Sleight 1965:228). However, a mid-summer high in transport volume and surface current strength, which possibly constituting more treacherous conditions, may have been exploited to push the Lucayans along the Florida Atlantic coastline. Under such a model, the winter low could have been employed for decreased resistance for return voyages to the Bahamas. The extent to which the motion of the Florida Current affected the possibility of prehistoric contact between the Bahamas and Florida may be inferred from the following study.

Horvath and Finney (1976) conducted a series of paddling experiments specifically targeting the issue of human endurance and capability in prehistoric Pacific travel off the



California coast and in the waters near the Hawaiian islands. Although these tests were carried out for use in studies of Pacific travel, the sail-less canoe and crew size likely approximates that of the small Caribbean vessels discussed in the historic sources. The vessel of the Horvath and Finney (1976:48) experiments was 12.2 m in length and carried a crew of twelve men of varying paddling experience. Horvath and Finney (1976:49) found that the realistic maintainable speed of the paddlers was 4 knots (kts) (7.4 km/h) . This rate of travel is insufficient to paddle 'upstream' against the stronger flow of the Gulf Stream (which may be up to 5.5 kts). Maul et al. (1991) show that the surface speeds of the Florida Current are much stronger (up to 5.5 knots) near the Florida coast than for the rest of the current (which ranges from 1.2 to 3.3 knots, on average). The fatigue of the 52 nautical mile (nmi) (96.3 km) experimental journey took a significant toll on the test subjects. The men lost a considerable amount of body weight even though food and water were readily available in the vessel. While the subjective observations of the test subjects were that, given sufficient rest, food, and water, they could keep up the trek for several consecutive days. Horvath and Finney (1976:53) state that the material needs of the

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travelers would necessitate a large vessel. Horvath and Finney (1976:54) comment that the results of this study suggest that "a crew of physically fit and experienced paddlers" could paddle a canoe more than 50 nmi (92.5 km) in two days, a distance extremely close to that between Grand Bahama and Palm Beach, Florida (approximately 100 km). However, travelers leaving from Grand Bahama may have had an easier time of paddling than Horvath and Finney's (1976) test subjects, as they would have the pushing assistance of the Florida Current. Conversely, individuals departing from Florida, as per the results of Horvath and Finney (1976), would likely be incapable of sustaining the necessary speed to stem the Florida Current down its axis. The results of Horvath and Finney's (1976) experiments seem to make the possibility of contact between Florida and the Bahamas unlikely due to the strength of the Florida Current, but not contact from the Bahamas to Florida. The strength of the current as it moves up the Atlantic coast equals or exceeds (depending on the season) the maximum sustainable speeds of the paddlers in the Horvath and Finney (1976) study.

In addition to the Horvath and Finney (1976) experimental study, some information can be extracted from Blanchard's (1999) study on near shore voyaging. Blanchard states that vessels with a crew of two or more would have been hard pressed to paddle into winds in excess of twelve knots. Such a factor would be a consideration for return voyages against the Florida Current (even without adverse winds, Blanchard's 1999 study supports the difficulty of paddling against strong current).

The Florida Current makes for a difficult situation when considering return voyages of the Lucayans or voyages of Florida Indians to the Bahamas. The strength of this current likely constituted a considerable hindrance to such movements (as demonstrated above). However, Irwin (1992) argues against voyages of no return. He states that death or the possibility of not returning from excursions would have been significant deterrents to prehistoric voyagers. I argue that the oceanic-oriented Lucayans may have been able to

negotiate the strong currents in the Straits of Florida using large crews and exploiting the variations in the surface currents and winds across the Straits. Such a strategy may have included riding the Florida Current northward and paddling in a northeasterly direction to stem the near-shore currents (the strongest in the Straits) and then turning in a southeasterly direction and paddling against the weaker (1.2-3.3 kt) eastern margin of the Florida Current for the remainder of the return voyage. The smaller canoes from Florida (Newsom and Purdp 1993) probably did not have the capacity for large enough crews to overcome the current. This contention returns to the earlier mentioned dichotomy of riverine versus oceanic orientations of seafaring capabilities. While the Lucayan Taino were likely accustomed to the conditions of operating a craft on the open ocean, due to centuries of experience from interisland trading and other types of ocean-going travel, the Floridian groups were more likely suited to riverine, marsh, and near-shore aqueous environments. The differences in the skills necessary to negotiate these divergent environments suggests that, out of necessity, the Lucayans, with their oceanic knowledge, would be the more likely initiators of contact across the treacherous Florida Current than their riverine focused Floridian counterparts.

If prehistoric voyagers had departed the northern Bahamian islands in search of land to the north, it is probable that they were not able to cross the Florida Current directly to southern Florida, but rather that they would have been swept up in the current and dragged along the east coast of Florida. In any case, the natural direction of exploration from the Bahamas would likely be in a northwesterly direction due to the roughly northwest-southeast orientation of that island archipelago. This orientation of the Bahamian archipelago might have suggested to the prehistoric Lucayans that more uninhabited islands were located to the northwest of the northernmost Bahamian islands. Rather than contact between the inhabitants of southern Florida such as the Calusa or the Tequesta, it seems more probable that if any contact was made between the Lucayans and the North American aborigines it would have begun further north, perhaps in the areas of the Jeaga (Palm Beach County) or Ais (St. Lucie, Indian River, and Brevard Counties) or the Timucua of the St. Johns River and present day St. Augustine and Jacksonville: or possibly along the coasts of Georgia or South Carolina.

## **Wind Patterns in the Straits of Florida and Surrounding Areas**

Although the sail-less canoes, which are believed to be the most common mode of long-distance transportation in the pre-Columbian Bahamas, would not typically be in danger of adverse sailing conditions created by strongwinds, winds of 12 knots or stronger may still have presented difficulty for small crews attempting to paddle a sail-less canoe (Blanchard 1999). Wind strengths reported on maps from the DMA (1994) were compared against Blanchard's (1999) benchmark of 12 kts as difficult rowing conditions. This benchmark (12 kts) falls within the force 4 strength winds on the Beaufort Scale of Wind Strength. The Beaufort Scale, divided into 12 "forces" ranging from call 11 to hurricane strength conditions (Rousmaniere 1989:132), is the standard measure used to present average wind strengths on the DMA maps (1994). The majority of the wind

strengths in the area of the Straits of Florida (including the Floridian East Coast and the Northern Bahamian islands) are reported to average Beaufort Scale force 4 (11-16 kts) year-round. Because wind strength in the Straits is relatively constant, direction is a more important factor.

For travel to have occurred from the Bahamas to Florida, low frequencies of winds from the North (Southerly winds) and the West (Easterly winds) would have been favorable. The mid-summer months (June/July) exhibit the best such conditions. Although the winds from the North are low in frequency during the mid-summer, this is the time at which the Florida Current is at its strongest (and the Straits most treacherous for watercraft). However, the Lucayans may have chosen to exploit this extra push from the Florida Current during the summer months: coupled with the reduced fre-

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quency of resistance from Southerly winds to propel them from the northernmost Bahamas to the United States mainland. If such a strategy were employed, the Lucayans could have exploited the reduced flow of the Florida Current and the increased frequency of Southerly winds during the months of October or November to accomplish the return voyages to the Bahamas (a necessary component of autocatalytic voyaging suggested by Twin 1992). One factor which would aid Bahamas to Florida voyages and hinder Florida to Bahamas voyages are the Prevailing Westerlies. i.e., the high frequencies of westward blowing trade winds which are common in the Caribbean. Such winds, if sustained and powerful (12+ kts), might push travelers in the Florida Current towards the Florida mainland. The frequency of these winds in the Straits of Florida are highly variable and although they are not at the peak of their occurrence in October or November (during the Florida Current calms), a moderate frequency of these winds exceed 11 kts (Beaufort Scale force 4 to 5) at this time (DMA 1994). Such conditions might have significantly hampered efforts for Florida to Bahamas voyaging or return voyages for Lucayans who had landed in Florida.

## **Sea-Level Change and the Flow of the Florida Current**

The importance of the sea-level stand on both sides of the Straits of Florida to the current issue is twofold: increases in the sea-level may obscure coastal sites that yield evidence of contact and the sea-level has a direct correlation to the transport volume through the Straits. Therefore, a clear understanding of the late prehistoric sea-level stands in the northern Bahamas and along the Florida Atlantic coast should lead to a clearer picture of site locations and the natural barriers to contact. Although rising sea-levels over the past 12,000 years have been demonstrated to obscure archaeological sites on the Gulf Coast of Florida (see Dorsey 1997) a widespread inundation of sites on the Atlantic coast of Florida is highly unlikely due to the morphological differences of the continental shelf on either side of the Florida peninsula. As was stated earlier the Straits of Florida constitute a steep drop in the depth of the ocean floor not far from the visible coastline of Florida on

the Atlantic side of the peninsula (see Figure 5) Therefore the amount of land when compared to the Gulf side of the peninsula, which has been inundated over the past 1000 years (the reasonable earliest date of possible contact) is probably negligible. This is not, however, meant to undermine the importance of such sea-level studies of the Atlantic coast. Rather it is a generalization which may be oversimplified for a few individual areas, as there are some submerged sites off of the Atlantic Coast of Florida (e.g., 8SSL17), however, they are too early to be relevant to the contact issue.

Watters (1981; 1992) advocates the examination of episodic sea-level fluctuations for the purposes of identifying and interpreting submerged sites, especially in the Caribbean. Mitchell and Keegan (1987), however, do not find evidence that significant numbers of sites are obscured by sea-level changes in the Bahamas. They state that evidence from coastline studies suggest a change in sea-level in the Bahamas with 50cm of the present sea-level stand for the past 1400 years Valdes (1994, 1996) also supports the unlikely probability for the sea-level changes worldwide to have affected the identification of sites in the Bahamas.

In recent years, archaeologists have focused on sea-level changes on the Gulf Coast of Florida (see Dorsey 1997, Walker et al 1994, 1995) as have other scholars in the Bahamas (see Valdes 1994, 1996). These studies demonstrate that the familiar Holocene model for a smooth, constant sea-level rise over the past 12,000 years (e.g. Fairbridge 1974, 1984) is an average curve which may obscure certain details important to archaeologists, but not necessarily relevant to the geologists who created the model (Walker et al. 1994: 161). Such nuances, which may have been overlooked in the Holocene model, may also play a significant role in the issue of Bahamian-Floridian contact; they may obscure minor fluctuations in sea-levels that could have influenced the transport of the Florida Current.

Maul et al. (1985) report a linear correlation ( $r^2=0.93$ ,  $\alpha=0.05$  for Jupiter;  $r^2=0.74$ ,  $\alpha=0.05$  for Miami;  $r^2=0.94$ ,  $\alpha=0.05$  between Jupiter and the Bahamas) between minute sea-level fluctuations and the transport of the Florida Current. The statistical results reported above are from regression tests which examine the relationship of the transport volume of the Florida Current to the sea-level stand at the time of measurement. These data show a strong correlation between sea-level and transport volume (the closer the  $r^2$  statistic is to 1.0 the more one variable explains the other) (Maul et al. 1985). So, in this case sea-level changes can account for 93%, 74%, and 94% respectively for each of the three locations measured at the 95% confidence level ( $\alpha=0.05$ ). Maul et al. (1985:307) suggest that the overall transport of the Florida Current can be inferred from measurements of sea-level with an error of only  $\pm 1 \times 10^6 \text{ m}^3 \text{ s}$  (less than 1Sv). Thus, as the sea-levels drop, so do the transport volume and the surface speeds.

Episodic sea-level fluctuation is considered for the Gulf Coast of Florida by Colquhoun et al. (1995). Walker et al. (1994), and Walker et al. (1995), and may hold some significance for the Florida Current. Several investigators (Alexander 1974; Fairbridge 1974, 1984; Robbin 1984) have noted a general trend of increase in sea-levels during the most recent part of the Holocene (c. 6,000 B.P. to present) in southern Florida. Although

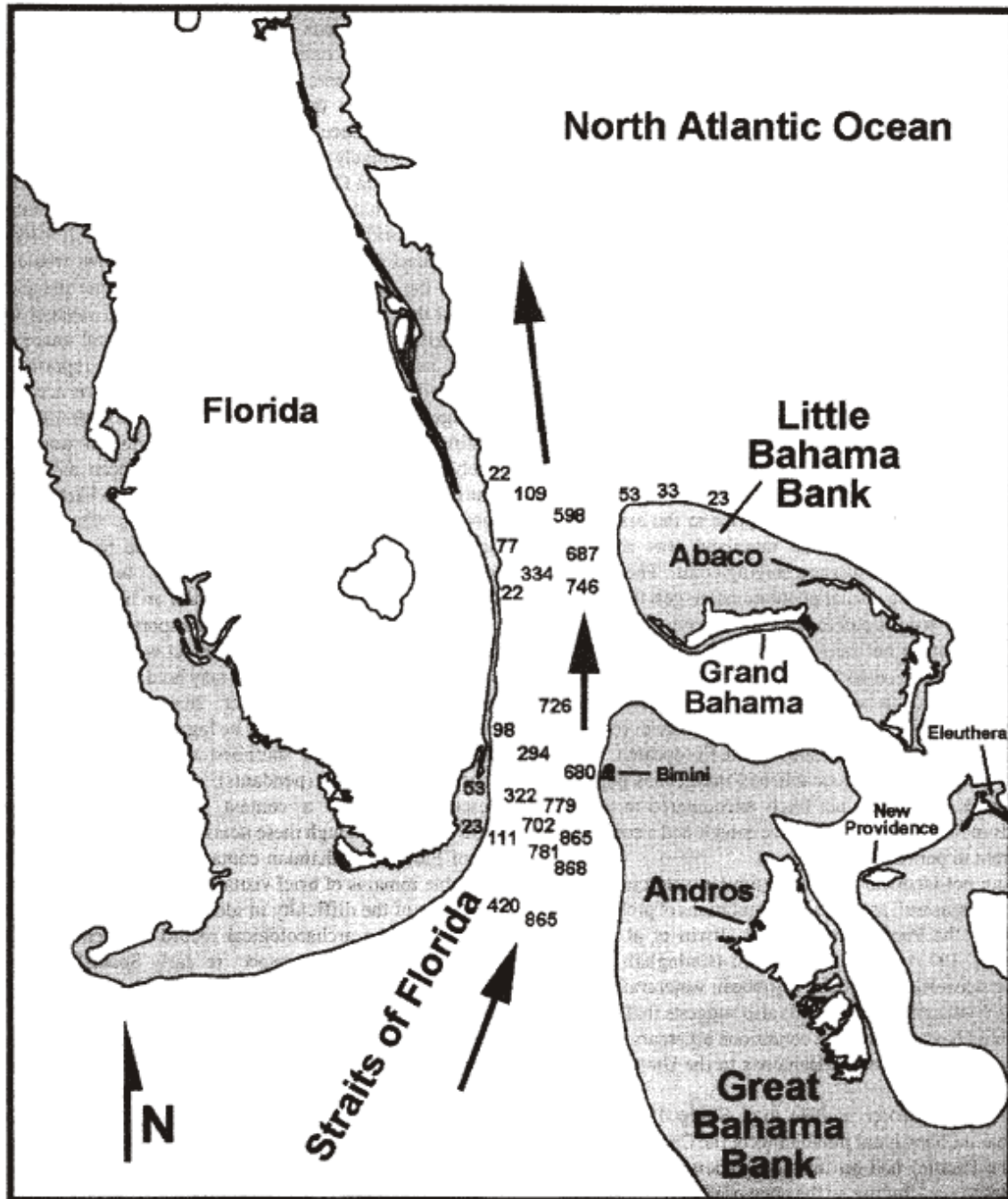
not a constant increase. Robbin (1984:441) notes that the sea-level stand has never been higher than present during the Holocene. This increase, noted as +1.2 mm/yr from 7,000-2,000 years B.P. and +0.3 mm/yr from 2,000 B.P.- present by Robbin (1984:437) (a trend generally agreed upon by Fairbridge 1984:431), may have resulted in lower transport means on the other side of the peninsula. and presumably somewhat easier traveling conditions for the Pre-Columbian inhabitants of the Bahamas (also suggested by Nicholson 1976b for the rest of the Caribbean).

#### Discussion

Unfortunately, no universally accepted diagnostic remains or other archaeological evidence has been found that links the

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#### **Figure 5**



This map (after NOAA 1998) illustrates the basic topography of the area around the Straits of Florida. The shaded areas indicate the shallower continental shelves. The numbers indicate depth soundings (in meters) in the Straits of Florida. The large arrows indicate the general flow of the Florida Current through the Straits of Florida.

prehistoric inhabitants of the Bahamas to those of Florida and the rest of the North American mainland. In the absence of such incontrovertible evidence, I will summarize my main points.

It can be stated with reasonable certainty that the indigenous populations of the Caribbean (the Lucayan Taino in particular) inhabited the northernmost islands of the Bahamas before the arrival of the Europeans in 1492. Many of the

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scholars examining motivations for migration and colonization in the Bahamas argue for push/pull motivators. Such an approach likely necessitates long lapses of time for resource depletion and/or population growth to force migration. If the Lucayans had arrived very late in the prehistoric period to the northernmost Bahamian islands, such a push/pull perspective, if true, would probably negate the possibility of migration attempts to North America. Simply, there just would not have been enough time for the push/pull factors to impel a migration before the arrival of Columbus. However, under these models the possibility of contact is not ruled out entirely. Keegan (1985) suggests that exploration parties likely voyaged from the home island in advance of push/pull factors necessitating the search for new land. These exploratory expeditions may have reached the North American mainland in search of new lands prior to the arrival of the Europeans or the onset of demographic and or economic need for such knowledge.

Other scholars (Irwin 1992; Keegan and Diamond 1987) suggest that although push/pull factors may have existed, such consequences were not necessary to initiate migrations. With the northernmost Bahamas inhabited prior to the arrival of Europeans, the North American mainland was ripe for exploration with the Bahamas as a staging point. The migration theories concerning insular populations suggest that, even under the restrictive push/pull models, the potential existed for at least exploration (if not colonization) in a northerly direction prior to European contact.

If contact occurred, it may have simply been too late in the prehistoric period for colonies to be established (due to decimation of the native populations by the Europeans). This possibility, coupled with the established indigenous populations in Florida, a problem not likely encountered in newly found lands in the Bahamas, may have constituted a considerable deterrent to permanent settlement.

Although not identical in design, similar watercraft from Pacific contexts, as well as computer simulations of prehistoric voyages from the Pacific (Irwin 1992; Irwin et al. 1990; Levison et al. 1973) and the Caribbean (Callaghan 1999) support the seaworthiness of the Caribbean watercraft. The study by Horvath and Finney (1976) also suggests that human paddlers could have endured the conditions necessary to cross the Straits of Florida from the Bahamas to the United States mainland.

In contrast to earlier studies (e.g. Sharp 1964), it is probable that the aboriginal inhabitants of the Caribbean (like those of the Pacific) had an intimate understanding of the natural clues to way-finding on the open ocean. As previously stated, based on the work of Horvath and Finney (1976), the flow of the Florida Current (when considering northward travel) was manageable all year, with the months of October- November the least treacherous for navigating the Florida Current due to the reduced flows.

Additionally, the Atlantic cyclone season begins to slow down during the late Fall. Active cyclone seasons could have enhanced the danger of navigating the Florida Current during the mid-summer months, even though, in general, wind conditions were more favorable during this period.

The archaeological evidence is minimal for contact between the Bahamas and the North American mainland. Why, then, if such contact was likely, based on technology and environment, is there such a dearth of archaeological evidence? Based on the flow of the Florida Current, those looking for evidence of contact may be looking in the wrong place. It is unlikely that the Lucayans would have been able to cross the Florida Current at a 90 degree angle to the flow, or even close to that trajectory. This fact alone rules out much of southern Florida as a possible landing location. It is likely if such contact did occur, that the Florida Current would have pushed the Lucayans along the coast for some distance. I suggest that possible landing points for such voyages would not begin until the Melbourne/Cape Canaveral area (which would help explain the Antillean axe head reported near Gainesville by Goggin and Rouse 1948). Historic accounts of sailings from the Bahamas also support this location as a likely destination in Florida. Additionally, while it would seem likely that ceramic vessels would have been employed to transport foodstuffs on long voyages, it is also likely that they served the same purpose on return voyages. Therefore, I do not suggest ceramic technologies as the best method for identifying Bahamian/Floridian contact. In order to identify considerable ceramic samples in the archaeological record, more long term contacts, rather than sporadic encounters, are necessary, and such sustained contact is unlikely. I suggest that small, portable trade items may hold the artifactual key to interpreting prehistoric contact. Items such as trade beads, pendants, or small zemis may be logical diagnostic items to be looking for along the southeastern United States Atlantic coast. Small items (pendants), collected by De Booy, are described in such a context on Bimini by Granberry (1957:380). Although these items do not support the possibility of Floridian/Bahamian contact, they do demonstrate the probable remains of brief visitations: small, portable objects. Instances of the difficulty in identifying brief visitations and contacts in the archaeological record are demonstrated by Milanich (1995) with respect to early Spanish forays into Florida. Milanich (1995: 110) suggests that, "because of the short duration of both [of Ponce de Leon's excursions], it is unlikely that the exact location of his landings will ever be pinpointed." Graves and Addison (1995:388) also outline similar difficulties of identifying such brief visitations in the Hawaiian archaeological record.

Migration and colonization studies of the Bahamas suggest a late arrival of Lucayans in the Northern Bahamian islands: which would have led to a very late arrival in prehistory of Lucayans in Florida (if such contact occurred at all), a factor which may not be conducive to the establishment of permanent settlements. Additionally, indigenous groups were already established all along the eastern seaboard in the United States, a contingency not likely experienced by the Lucayans in other new areas in the Bahamas. If contact did occur, what were the ramifications of the meeting of these two cultures? It is possible that Florida Indians met the Lucayans with hostility, effectively restricting the establishment of permanent settlements.



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In conclusion, based on the combined evidence presented in this paper, it is my contention that contact was technologically possible between the prehistoric populations of the Bahamas and the indigenous peoples of North America. Environmentally, the conditions presented by the Florida Current and the winds in the Straits of Florida would have presented the Lucayans with a situation to which they may not have been accustomed. Having examined the available evidence from the Caribbean and the Pacific, I am confident that contact (at least in an ephemeral sense) was likely. However, the lateness of this possible contact resulted in a lack of transfer of significant cultural influences. If such contact did occur, it was likely north of the presently assumed area of southern Florida. However, until diagnostic cultural materials are recovered from the United States to substantiate these hypotheses, such studies remain speculative.

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